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EXAMINER
VINH, LAN

ART UNIT	PAPER NUMBER
1765	12

DATE MAILED: 03/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/677,478	Applicant(s) BLALOCK ET AL.	
	Examiner LAN VINH	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,10-13,16-19,21-28,30-42,44-50 and 53-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *59* is/are allowed.

6)☒ Claim(s) *1-7,10-13,16-18,21-28,30-42,44-50 and 53-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *11* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Application/Control Number: 09/677,478
Art Unit: 1765

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-5, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kilgore et al (US 6,200,412) in view of Qian et al (US 6,136,211)

Kilgore discloses a plasma etching method comprising the steps of:

etching a semiconductor wafer having a film formed thereon by flowing fluorocarbons gas/plasma etching material into the chamber to form residual deposits of fluorine/halogen and fluorine compounds over the surface of the reaction chamber (col 4, lines 20-47, col 6, lines 11-12), which reads on etching a semiconductor wafer having a film thereon with a plasma etching material to form residual deposit of fluorine/halogen over at least some internal surfaces of a plasma etch chamber

subsequently, plasma etching using hydrogen plasma to remove/etch the fluorine residual deposits from the surfaces of the reaction chamber and to remove film formed on the wafer, the hydrogen component reacts with the fluorine/halogen to form gaseous HF (hydrogen halide) (col 6, lines 18-61) reads on after forming the residual deposits, plasma etching using a gas effective to etch the residual fluorine deposits from chamber internal surfaces, the gas having a hydrogen component effective to form a gaseous hydrogen halide from halogen/fluorine liberated from the polymer. Kilgore also

discloses flowing 50 sccm of hydrogen gas and 500 sccm of O_2 into the chamber during the plasma etching step (col 6, lines 41-43), which reads on the gas comprises hydrogen and O_2 at a volumetric ratio of 50:500 or 0.1/1

Unlike the instant claimed invention as per claim 1, Kilgore does not specifically disclose forming a photoresist material on the wafer and forming a polymer comprising carbon and a halogen over the internal surface of a plasma chamber although Kilgore discloses forming residual deposits of fluorine/halogen and fluorine compounds over the surface of the reaction chamber.

However, Qian, in a self-cleaning etch process to etch a wafer having photoresist formed thereon and to remove photoresist using plasma etching and fluorocarbon gases, discloses that etch residues (on the chamber wall) formed in the etching step typically comprises polymeric organic compounds containing halogen, carbon (col 8, lines 24-26, col 9, lines 46-47;col 11, lines 25-26)

Since Kilgore discloses etching a semiconductor wafer having film formed thereon using fluorocarbon gases to form residual deposits of fluorine/halogen compounds in the chamber, one skilled in the art would have found it obvious that Kilgore etching step using fluorocarbon gas would have required a photoresist formed on the wafer and resulted in forming a polymeric residual deposit comprising carbon and a halogen in view of Qian's teaching especially since Qian states that the etch residues formed in the first etching stage typically comprises polymeric compound containing carbon and fluorine (halogen) (col 6, lines 30-31)

The limitation of fluorine as the claimed halogen as recited in claims 2 and 3 has been discussed above.

Regarding claim 4 and 5, Kilgore discloses that oxygen can be used with the hydrogen plasma (col 6, lines 42-43)

The limitation of claim 7 has been discussed above.

3. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kilgore et al (US 6,200,412) in view of Qian et al (US 6,136,211) and further in view of William et al (US 5,647,953)

Kilgore as modified in view of Qian teaching has been described above in paragraph 2. Kilgore and Qian differ from the instant claimed invention as per claim 6 by using hydrogen component instead of ammonia.

However, William discloses that fluorine residues/polymer can be removed by a reducing gas such as hydrogen, ammonia (col 2, lines 61-63)

Hence, one skilled in the art would have found it obvious to substitute Kilgore's hydrogen plasma to remove /etch residue with ammonia in view of William teaching because both hydrogen and ammonia are known reducing gas having the same function of removing fluorine residue; thus, the substitution of one for the other would have produced an expected result.

4. Claims 10-13, 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cui et al (US 5,965,463) in view of Yanagida (US 5,445,712) and further in view of Qian et al (US 6,136,211)

Cui discloses a plasma etching method comprising the steps of:

etching oxide on a wafer with fluorocarbons gas/plasma etching material to form a polymer comprises of carbon and fluorine/halogen on all surfaces/internal surface of a plasma chamber (col 2, lines 4-11)

performing a post etch plasma etching using a gas to remove/etch the polymer from the chamber surface (col 10, lines 24-25) reads on after forming the polymer, plasma etching using a gas effective to etch polymer from the chamber internal surfaces. Cui also discloses using a gas C_4F_8 / the gas comprises a carbon compound to remove polymer from chamber surface. Cui also discloses flowing a gas mixture comprises 10 sccm of O_2 and 20 sccm of C_4F_8/carbon compound (col 8, lines 63-65), which reads on the gas comprises an oxygen and carbon compound mixture wherein the carbon compound is provided at from 5% to about 80% by volume of the mixture.

Unlike the instant claimed invention as per claim 10, Cui does not specifically discloses the carbon compound effective to getter/to remove halogen from the etched polymer.

However, Yanagida discloses a plasma etching method comprises the step of using a carbon compound gas to form gaseous HF / to form a gaseous hydrogen halide from the etched fluorine/halogen (col 2, lines 25-29). Yanagida teaching reads on using the carbon compound effective to getter/to remove halogen from the etched polymer.

Hence, one skilled in the art would have found it obvious to employ Cui carbon compound gas to getter/ to remove the halogen from the etched polymer as per Yanagida because Yanagida states that C atoms combined with halogen radicals dissociated from the halogen compound and is quickly removed in the form of halide (col 4, lines 6-10)

Cui and Yanagida do not explicitly disclose plasma etching using a gas effective to etch polymer from chamber internal surface at subatmospheric.

However, Qian discloses a self-cleaning etch process using CF_4/ carbon compound gas to etch polymer from chamber internal surface at 4-9 mTorr pressure in the chamber (subatmospheric pressure) (col 9, lines 43-46; col 15, lines 5-7).

Thus, one skilled in the art would have found it obvious to modify Cui and Yanagida method by using a carbon compound gas to etch polymer/etchant byproduct from chamber internal surface at 4-9 mTorr/subatmospheric pressure as per Qian because according to Qian etchant byproduct are exhausted from the process chamber through an exhaust system capable of achieving a minimum of about 10^{-3} Torr/subatmospheric pressure (col 6, lines 5-7)

The limitation of claim 11 has been discussed above.

Regarding claim 12, since Cui discloses using CO gas during the etching process, one skilled in the art would have obvious that Cui's CO gas would have formed a gaseous COF in view of Yanagida teaching so the gaseous COF can be removed from the chamber.

Regarding claim 13, Cui discloses using CHF_3/ hydrocarbon gas (col 11, lines 13-14)

Regarding claims 16-18, Cui discloses flowing CO gas into the chamber (col 9, lines 24-25)

The limitation of claim 19 has been discussed above.

Regarding claim 20, Cui discloses using oxygen plasma (col 10, lines 30-31)

5. Claims 21-26, 28, 30, 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kilgore et al (US 6,200,412) in view of Qian et al (US 6,136,211) and further in view of Saito et al (5,681,424)

Kilgore discloses a plasma etching method comprising the steps of:

resting/positioning a semiconductor wafer on a platen (claimed wafer receiver) within a chamber (col 56-58)

flowing fluorocarbons gas into the chamber to remove/etch material on the wafer and to form residual deposits of fluorine/halogen over the surface of the reaction chamber (col 6, lines 11-12) reads on first etching material on the wafer with a gas comprising carbon and halogen to form residual deposit of halogen over at least some internal surfaces of a plasma etch chamber

subsequently, with the wafer on the platen/wafer receiver, plasma etching using hydrogen plasma at 0.1-5.Torr/subatmosheric pressure to remove/etch the fluorine residual deposits from the surfaces of the reaction chamber, the hydrogen component reacts/getter with the fluorine/halogen to form gaseous HF (hydrogen halide) (col 6,

lines 18-22) reads on after the first plasma, plasma etching using a gas effective to etch the residual fluorine deposits from chamber internal surfaces, the gas having a hydrogen component effective to form a gaseous hydrogen halide from halogen/fluorine liberated from the polymer. Kilgore also discloses maintaining the reaction chamber components at the temperature of 25-150^0 C (col 6, lines 24-25), which reads on the second plasma etching is conducted with the receiver having a temperature whch is allowed to float/change

Unlike the instant claimed invention as per claim 21, Kilgore does not specifically disclose forming a polymer comprising carbon and a halogen over the internal surface of a plasma chamber although Kilgore discloses forming residual deposits of fluorine/halogen and fluorine compounds over the surface of the reaction chamber.

However, Qian, in a self-cleaning etch process using plasma etching and fluorocarbon gases, discloses that etch residues (on the chamber wall) formed in the etching step typically comprises polymeric organic compounds containing halogen, carbon (col 9, lines 46-47;col 11, lines 25-26)

Since Kilgore discloses using fluorocarbon gases to form residual deposits of fluorine/halogen compounds in the chamber, one skilled in the art would have found it obvious that Kilgore etching step using fluorocarbon gas would have resulted in forming a polymeric residual deposit comprising carbon and a halogen in view of Qian's teaching especially since Qian states that the etch residues formed in the first etching stage typically comprises polymeric compound containing carbon and fluorine (halogen) (col 6, lines 30-31)

Kilgore and Qian do not disclose etching the polymer from chamber internal surface to restrict further etching of the material during the second plasma etching.

Saito discloses a plasma etching method comprises the step of using a cleaning gas to remove the polymer on the chamber surface and to suppress/restrict further etching of the material (oxide) on the wafer (col 1, lines 63-65 and col 4, lines 53-54)

Hence, one skilled in the art would have found it obvious to employ Kilgore and Qian cleaning gas to reduce further etching of the material in view of Saito teaching in order to reduce etching time by eliminating the overetching time (col 5, lines 6-8)

Regarding claim 22, Kilgore does not disclose that the chuck/receiver is biased during the first plasma etching and provided at ground or floating potential during a second plasma. However, Qian also teaches biasing the chuck/receiver during the first plasma etching and the receiver is provided at floating potential during a second plasma (col 7, lines 6-7, lines 55-57). Thus one skilled in the art would have found it obvious to modify Kilgore by providing the receiver/chuck at floating potential during a second plasma to generate a electrostatic charge for electrostatically holding the substrate/wafer to the receiver (col 7, lines 57-58)

The limitation of claims 23, 25, 28 has been discussed above.

Regarding claim 24, Kilgore discloses keeping the chamber pressure at 0.1 to 5 Torr (col 6, lines 44-45) reads on the claimed range of 30 mTorr-5 Torr

Regarding claim 30, Kilgore discloses performing the etching and cleaning step in a same chamber (in-situ) at pressure of 0.1-5 Torr/subatmosheric pressure (col 6, lines 33-45)

Regarding claim 58, Kilgore also discloses maintaining the reaction chamber components at the temperature of 25-150^0 C (col 6, lines 24-25), which reads on the the second plasma is conducted with the receiver having a temperature without maintaining the temperature within a controlled range.

6. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kilgore et al (US 6,200,412) in view of Qian et al (US 6,136,211) and Saito et al (US 5,681,424) and further in view of William et al (US 5,647,953)

Kilgore as modified by Qian and Saito has been described above in paragraph 5. Kilgore, Qian and Saito differ from the instant claimed invention as per claim 6 by using hydrogen component instead of ammonia.

However, William discloses that fluorine residues/polymer can be removed by a reducing gas such as hydrogen, ammonia (col 2, lines 61-63)

Hence, one skilled in the art would have found it obvious to substitute Kilgore, Qian and Saito hydrogen plasma to remove /etch residue with ammonia in view of William teaching because both hydrogen and ammonia are known reducing gas having the same function of removing fluorine residue; thus, the substitution of one for the other would have been produced an expected result.

7. Claims 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kilgore et al (US 6,200,412) in view of Qian et al (US 6,136,211) and Saito et al (5,681,424) and further in view of Yanagida (US 5,445,712)

Kilgore as modified by Qian and Saito has been described above in paragraph 5.

Kilgore, Qian and Saito differ from the instant claimed inventions as per claims 31-33 by gettering/removing the etched polymer using hydrogen instead of a carbon compound

However, Yanagida discloses a plasma etching method comprises the step of using a carbon compound (C-O bond) gas to form gaseous HF / to form a gaseous hydrogen halide from the etched fluorine/halogen (to getter halogen from the etched fluorine) (col 2, lines 25-29)

Hence, one skilled in the art would have found it obvious to modify Kilgore, Qian and Saito by using a carbon compound (C-O bond) to getter halogen from the etched fluorine as per Yanagida because hydrogen plasma and carbon compound plasma have the same function of removing/gettering halogen from the etched polymer; thus the substitution of one for the other would have produced an expected result.

8. Claims 36-42, 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cui et al (US 5,965,463) in view of Hong (US 6103,070) and Kilgore et al (US 6,200,412) and further in view of Saito et al. (US 5,681,424)

Cui discloses a plasma etching method comprising the steps of:

positioning a semiconductor wafer on a pedestal/electrostatic chuck within an inductively coupled plasma etch chamber (col 6, lines 32-36), the wafer having a photoresist layer 18 formed on an insulating layer 16 (oxide), the photoresist layer having opening patterns (fig. 5)

providing the wafer receiver with low bias power (col 10, lines 31-33)

using the patterned photoresist as a mask to etch opening within the insulating layer 16 with fluorocarbons gases (carbon and fluorine) to form a polymer comprises of carbon and fluorine/halogen on all surfaces/internal surface of a plasma chamber (col 2, lines 4-11;col 5, lines 59-61)

subsequently, with the wafer on the pedestal/electrostatic chuck (col 10, lines 30-33) using oxygen gas/oxygen component in a second oxygen plasma to etch the photoresist and to remove/etch the polymer from the chamber surface (col 5, lines 60-61; col 10, lines 24-25)

Unlike the instant claimed invention as per claim 36, Cui does not disclose providing negative bias voltage in a range of 100-400 volts to the wafer receiver.

However, Hong, in a plasma etching method, teaches providing negative bias voltage in a range of 100 volts to the wafer receiver (col 10, lines 32-64)

Hence, one skilled in the art would have found it obvious to modify Cui method by providing negative bias voltage to the wafer receiver as per Hong because according to Hong a pedestal bias voltage in the range of –100 volts is satisfactory for many applications (col 10, lines 62-64)

Cui and Hong differ from the instant claimed invention as per claims 36, 37 by performing the second plasma using oxygen component instead of a gas comprising an oxygen and a hydrogen component to form HF from fluorine (halogen) liberated from the polymer/getter halogen liberated from the polymer.

However, Kilgore discloses a plasma etching method comprising the step of: plasma etching at 0.1-5 Torr/subatmospheric pressure using hydrogen plasma with oxygen to remove/etch the fluorine residual deposits from the surfaces of the reaction chamber, the hydrogen component reacts/getter with the fluorine/halogen to form gaseous HF (hydrogen halide) (col 6, lines 42-44)

Since both Cui and Kilgore are concerned with method of cleaning residue/polymer from the chamber surface, one skilled in the art would have found it obvious to modify Cui method by using hydrogen plasma with oxygen component to remove/etch the fluorine residual and to form HF as per Kilgore because Kilgore teaches that HF can be pumped away through the exhaust system of the chamber (col 6, lines 20-22)

Cui, Hong and Kilgore do not disclose etching the polymer from chamber internal surface to restrict further etching of the material/ widening of the opening during the second plasma etching.

Saito discloses a plasma etching method comprises the step of using a cleaning gas to remove the polymer on the chamber surface and to suppress/restrict further etching of the material (oxide) on the wafer (col 1, lines 63-65 and col 4, lines 53-54)

Hence, one skilled in the art would have found it obvious to employ Cui, Hong and Kilgore cleaning gas to reduce further etching of the material in view of Saito teaching in order to reduce etching time by eliminating the overetching time (col 5, lines 6-8)

The limitations as recited in claims 37, 38, 40, 42 have been discussed above

Regarding claim 39, Cui, Kilgore and Saito do not disclose the specific volumetric ratio/etchant concentration ratio. However, since it is known in the art of plasma etching

that etching parameter such as etchant concentration affects the etching rate (see prior art of record for evidence of this basis), it would be obvious to adjust the etchant concentration by optimizing the same by conducting routine experimentation for the purpose of obtaining desirable etch rate.

Regarding claim 41, the limitations of using ammonia as a hydrogen component has been discussed above in paragraph 4.

Regarding claims 44, Cui does not disclose conducting and maintaining the first and second plasma at subatmospheric pressure and the wafer remaining in-situ on the receiver during the first and second etching. However, Kilgore discloses performing the etching and cleaning step in a same chamber (in-situ) at pressure of 0.1-5 Torr/subatmosheric pressure (col 6, lines 33-45). Hence, one skilled in the art would have found it obvious to modify Cui by maintaining the first and second plasma at subatmospheric pressure and the wafer remaining in-situ on the receiver during the first and second etching as per Kilgore to initiate hydrogen plasma, the plasma is essential for dissociating the hydrogen and oxygen as well as providing ion bombardment to enhance the surface reaction necessary to remove fluorine residue (col 6, lines 30-32)

Regarding claims 45-46, Cui and Kilgore do not disclose that the gettering forming a gaseous COA, where A is the etched halogen. However, Saito discloses forming a gaseous CO after an etch step using oxygen and CHF_3 /carbon compound (col 4 lines 55-63). Hence, one skilled in the art would have found it obvious to modify Cui and Kilgore by using oxygen and CHF_3 /carbon compound to form a gaseous CO after an

etch step as per Saito because Saito states that COx can be easily removed from the chamber thus completing the cleaning (col 3, lines 41-42)

9. Claims 47-50, 53-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cui et al (US 5,965,463) in view of Yanagida (US 5,445,712) and further in view of Saito et al. (US 5,681,424) and Qian et al (US 6,136,211)

Cui method has been described above in paragraph 8. Cui differs from the instant claimed invention as per claims 47, 54 by performing the second plasma using oxygen component instead of a gas comprising an oxygen and a carbon component to etch photoresist from the substrate and polymer form the chamber surface and gettering fluorine liberated from the polymer.

However,Yanagida discloses a plasma etching method comprises the step of using a carbon compound gas to form a gaseous hydrogen halide from the etched fluorine/halogen/ to getter fluorine liberated from the etched polymer (col 2, lines 25-29)

Since both Cui and Yanagida are concerned with method of plasma etching and Cui also mentions using a gas comprises a carbon compound to remove polymer from chamber surface (col 10, lines 28-29), one skilled in the art would have found it obvious to employ Cui carbon compound gas to getter/ to remove the halogen from the etched polymer as per Yanagida because Yanagida states that C atoms combined with halogen radicals dissociated from the halogen compound and is quickly removed in the form of halide (col 4, lines 6-10)

Cui and Yanagida do not disclose etching the polymer from chamber internal surface to restrict further etching of the material/ widening of the opening during the second plasma etching.

Saito discloses a plasma etching method comprises the step of using a cleaning gas to remove the polymer on the chamber surface and to suppress/restrict further etching of the material (oxide) on the wafer (col 1, lines 63-65 and col 4, lines 53-54)

Hence, one skilled in the art would have found it obvious to employ Cui and Yanagida cleaning gas to reduce further etching of the material in view of Saito teaching in order to reduce etching time by eliminating the overetching time (col 5, lines 6-8)

Cui, Yanagida and Saito do not disclose that the chuck/receiver is biased during the first plasma etching and provided at ground or floating potential during a second plasma.

However, Qian also teaches biasing the chuck/receiver during the first plasma etching and the receiver is provided at floating potential during a second plasma (col 7, lines 6-7, lines 55-57). Thus one skilled in the art would have found it obvious to modify Cui, Yanagida and Saito by providing the receiver/chuck at floating potential during a second plasma to generate a electrostatic charge for electrostatically holding the substrate/wafer to the receiver (col 7, lines 57-58)

Regarding claim 48, Cui discloses using oxygen plasma (col 10, lines 30-31)

Regarding claims 49, 50, the limitations of using ammonia and hydrogen component have been discussed above in paragraph 2 and 3.

The limitation of claim 53 has been discussed above in paragraph 8.

The limitation of claim 55 has been described above in paragraph 10.

Regarding claims 56, 57, since Cui discloses using CO gas during the etching process, one skilled in the art would have obvious that Cui's CO gas would have formed a gaseous COF in view of Yanagida teaching so the gaseous COF can be removed from the chamber.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Clampitt (US 5,798,303) discloses that etching parameter such as etchant concentration may be varied to achieve desired etch rate (col 6, lines 29-31)

Allowable Subject Matter

11. Claim 59 is allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 59, the cited prior art of record fails to disclose the step of second plasma etching at subatmospheric pressure using a gas comprise oxygen, a carbon component and NH3 effective to etch photoresist from the substrate and polymer from the chamber wall. The closest prior art of Cui (US 5,965,463) discloses the step of second plasma etching at subatmospheric pressure using a gas comprise oxygen, C_4F_8/ carbon component to etch photoresist from the substrate and polymer from the chamber wall.

Response to Arguments

12. Applicant's argument filed on 12/30/2002 has been considered but they are not persuasive.

The applicants argue that the art of record do not teach a gas comprises oxygen and a hydrogen component provided during plasma etching. The examiner disagrees because as clearly recited in col 6, lines 41-43 of Kilgore, Kilgore discloses that hydrogen can be introduced with oxygen in the reaction chamber.

It is argued that the Cui reference is devoid of a teaching to a volumetric relationship between the carbon and oxygen. This argument is unpersuasive because as recited in col 8, lines 64-65, Cui discloses flowing 20 sccm of C_4F_8/carbon compound and 10 sccm of oxygen. Cui disclosure of the flow rate of carbon compound and oxygen in a gas mixture, as interpreted by the examiner, reads on a volumetric relationship between the carbon and oxygen.

In response to applicant's argument that there is no suggestion to combine the references of Cui and Yanagida , the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since the motivation comes from Yanagida (paragraph 4 above), one skilled in the art

would have found it obvious to combine Cui and Yanagida to produce the claimed invention.

Applicants argue that Kilgore has no teaching to a temperature that is allowed to change, or float. The examiner disagrees because Kilgore also discloses maintaining the reaction chamber components at the temperature of 25-150^0 C (col 6, lines 25-26), maintaining the temperature in the range, as taught by Kilgore, certainly reads on allowing the temperature to change/or float.

13 **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

14 Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN VINH whose telephone number is 703 305-6302. The examiner can normally be reached on Monday-Friday 8:30 -6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, BENJAMIN L UTECH can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

LV
March 21, 2003